

## ABSTRACT OF THE INVENTION

A large clear aperture cat's eye retro-reflector system that improves the optical efficiency by two orders of magnitude over conventional cat's eye retro-reflectors. It achieves this increase by using a wide-angle lens design with a curved focal plane, so the entrance aperture is not limited by the design constraints of a solid glass sphere. Since light reflected from a retro-reflector increases as the fourth power of the reflector aperture, light reflected from the retro-reflector of the present invention is increased by two orders of magnitude as compared to the prior art cat's eye retro-reflector of conventional size. When used as a communication device, the retro-reflector is preferably modulated by a quantum well modulator providing very high speed communication. In preferred embodiments a moving quantum well modulator is placed near the focal plane, where the beam footprint is much smaller than the entrance aperture, effectively allowing a small modulator to modulate a large diameter beam. A tracking system tracks the source of interrogating beams and positions the small modulator to intersect the incoming beam near the focal plane where the beam footprint is very small.